

Patent
Atty. Docket No. GEGR8082.002

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Yudong Zhu
Serial No. : 10/723,311
Filing Date : November 26, 2003
Title : Method and Apparatus to Reduce RF Power
Deposition During MR Data Acquisition
Group Art No. : 3732
Examiner : Shrivastav, B.

CERTIFICATION UNDER 37 CFR 1.8(e) and 1.10

I hereby certify that, on the date shown below, this correspondence is being:

Mailing

☐ deposited with the US Postal Service in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

37 CFR 1.8(a) 37 CFR 1.10

☐ with sufficient postage as first class mail ☐ As "Express Mail Post Office to Addressee" Mailing Label No.

Transmission

☒ transmitted by facsimile to Fax No.: 703-872-9306 addressed to Examiner Shrivastav at the Patent and Trademark Office.

Date: 2-11-05

Lisa J. Chaney
Signature

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 C.F.R. §1.131

I, Yudong Zhu, being duly sworn, depose and say:

1. That I am the inventor for the above-identified Patent Application;
2. That I have reviewed the claims of this Application;
3. That I conceived in the United States, prior to August 20, 2002, the effective date of the cited reference, USP 5,828,790, the invention as set forth in the aforementioned claims, and

Zhu, Yudong

SN: 10/723,311

in particular, a process and system to independently control a plurality of transmit coils of a transmit coil array.

4. Attached as Exhibited A is a copy of my disclosure letter titled "Acceleration of Focused Excitation with a Transmit Coil Array" to my employer that was prepared prior to August 20, 2002 evidencing conception of the above-captioned invention.

5. That from before August 20, 2002 to November 26, 2003, the filing date of the present application, I diligently worked toward reducing the above-captioned invention to practice and worked with patent counsel in the preparation of a patent application for the claimed invention.

That the statements made herein are of my own knowledge and are true and made on information and belief that are believed to be true.

I acknowledge that any willful false statements and the like made herein are punishable by fine or imprisonment, or both, and may jeopardize the validity of the application or any patent issuing thereon.


Yudong Zhu

Dated: Feb 8, 2005



RECEIVED
CENTRAL FAX CENTER

AUG 15 2005

GE Confidential & Proprietary Information.
This invention is being prepared for submission
to the GE Patent And Legal Operation. Attorney
work product may be contained herein.

GE Patent Disclosure Letter System

DOCKET NUMBER

30016

DOCKET DATE



TITLE OF INVENTION

Acceleration of Focused Excitation with a Transmit Coil
Array

GE TECHNOLOGY AREA(S)

- GE Healthcare - Medical (MSXX)

Keywords:

- o MR Magnets

PROJECT NAME

Advanced RF

PROJECT NUMBER

2125671003

PROJECT LEADER

Gontran Kenwood

BUSINESS OR ORG. CONTACT INFORMATION

NAME Tsuru Bernstein

PHONE NUMBER



Was this invention first conceived or reduced to practice in the performance of work under a contract between GE and another non-government third party? NO

Date Invention Conceived : [REDACTED]

Circumstances Invention Conceived i.e., described in patent notebook (include page #), technical report, letter, discussed in meeting minutes, etc.
Discribed in my notebook on page 80.

Was this invention first conceived or reduced to practice in the performance of work under a US Government contract?
NO

ABSTRACT OF THE INVENTION

Please write a brief explanation of the invention (Limit to 350 words)

A 2D selective excitation pulse produces an excited volume that is spatially localized in two dimensions. While allowing faster subsequent spatial encoding, the excitation involves time-consuming 2D k-space traversing. The present method uses multiple transmit coils exciting in parallel to accelerate multi-dimensional excitation. Specifically, it reduces excitation k-space sampling density without inducing aliasing side lobes in examined subjects by exploiting the localization characteristics of the coils. The underlying theory parallels that of SENSE-type imaging methods and leads to closed-form pulse designs for the small-tip-angle regime.

BACKGROUND OF THE INVENTION

Please describe the problem or requirement addressed by your invention.

Parallel imaging methods represented by SMASH and SENSE use multiple receive coils to accelerate acquisition ? they accommodate k-space sampling density reduction by integrating spatial information encoded with the coil sensitivity profiles. Under circumstances where anatomy of interest is contained in a local region, focused excitations that target the region through, for example, local small coil transmit or 2D excitation also allow sampling density reduction and hence speedup acquisition. However, the small coil method is less effective targeting a distant region or defining specific excitation volumes, and the 2D method leads to prolonged excitation periods reduction of which demands more capable gradients. We investigated the idea of accelerating focused excitations by formulating and solving the intriguing problem of finding an excitation counterpart to array-based parallel acquisition. We show in the following that excitation k-space sampling density may be reduced and 2D excitation accelerated by the means of multiple transmit coils exciting in

parallel. For the small-tip-angle regime we further give a closed form solution to the parallel excitation pulse design problem.

How has this problem or requirement been addressed before?

Focused excitations that target the region using local small coil transmit or body coil 2D excitation.

Is this disclosure letter related to any GE disclosure letters, patent applications or issued patents?

NO

Have you completed a prior art search? NO

Please list any relevant literature or patents of which you are aware.

DETAILED DESCRIPTION OF THE INVENTION

How does your invention work?

See attached descriptions for details.

Describe the important features of your invention and explain how to use the invention to solve the problems described above.

Parallel excitation with a transmit coil array that are independently driven by associated RF amplifiers. See attached descriptions for details.

What advantages are provided by your invention?

Compared to a body coil method, the present method produces comparable spatial localization at a fraction of time. Compared to a local small coil method, the definition/steering of the excitation volume is flexibly accomplished with coil current control. The method does not constrain the acquisition k-space trajectory or reconstruction, and may be used in conjunction with parallel acquisitions.

Has your invention been reduced to practice? NO

Briefly describe any efforts to make a prototype of your invention or to test your invention. Additionally, summarize the results of any related experiments and testing and highlight any results of particular significance.

See attached descriptions for details.

BRIEF DESCRIPTION OF THE DRAWINGS

Please describe the significance of any pictures,

drawings, graphs, diagrams, structures or figures and the type of picture along with the specific view or application to the invention.

See attached descriptions for details.

CLAIMED INVENTION

Please identify novel aspects that should be protected within this disclosure letter.

1. An excitation method that uses a transmit coil array to excite in parallel. 2. A design method for achieving faster focused excitation using the transmit coil array. 3. Define and steer an excitation volume through the means of controlling currents that drive the transmit coils.

ATTACHED FILES

plex.doc

DUTY OF DISCLOSURE		
a.	Have steps been taken to put into use, either outside GE or in our own operations?	No
b.	Has the invention or a product embodying or using it been sold or offered for sale?	No
c.	If the invention pertains to a process, have any steps been taken to employ the process commercially (e.g., for product production)?	No
d.	Has the invention been described in an electronic or printed publication?	No
e.	Has the invention been described to persons who are not employees of GE?	No
f.	Are there results available of a prior art search pertaining to this invention?	No
g.	Has anyone else associated with the project within GE (marketing, sales, sourcing, etc.) disclosed the invention or offered the invention for sale?	No
h.	If you answered Questions a-g as "NO", is any use, sale, publication, or disclosure of the invention now contemplated?	Yes

Steps Taken to Put the Invention into Use or Employ the Process Commercially?

Describe circumstances(e.g. product name, production of product, use of product or prototype)

Who? Name of contact person

Where? Company Name/ GE Technology Area

Country

When? approximate Date

Sold or Offered for Sale?

Describe nature of transaction

To Whom?

By Whom?

Where?

When?

**Described in Electronic or Printed Publication, or
Disclosed in a Talk or Paper Presented at a Public
Meeting**

To Whom?

By Whom?

Within GE or Outside GE?

Where? Journal/Meeting/Country

When?

CO-INVENTORS				
Name	Address	Global Tech. Center	Lab	Citizens
*Yudong Zhu		Imaging Technology (5300)	MRI Lab (5360)	P.R. Ch
*Lead co-inventor				

Primary / Financing Business (or Advanced Technology Program) :

Primary / Financing Component :

Associated Lab/Program : Imaging Technology (5300)/MRI Lab (5360)

Assigned Attorney : Jean Testa

[Print](#)

[Download](#)